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FIG. 1.

JDF-3 DNA polymerase nucleotide sequence: 2331 nucleotides (SEQ ID NO: 1)

ATGATCCTGACGTTGATTACATCACCGAGAATGGAAAGCCCGTATCAGGGTCTTCAGAAGGAGAACGG
CGAGTCAGGATTGAATACGACCGCGAGTTCGAGCCCTACTTCTACGCGCTCCTCAGGGACGACTCTGCCA
TCGAAGAAATCAAAAGATAACCGCGGAGAGGCACGGCAGGGCGTTAAGGTTAAGCGCGCGGAGAAGGTG
AAGAAAAAGTTCTCGGCAGGTCTGTGGAGGTCTGGTCTACTTCACGCACCCGCAGGACGTTCCGGC
AATCCCGACAAAATAAGGAAGCACCCCGCGGTATCGACATCTACGAGTACGACATACCCCTCGCCAAGC
GCTACCTCATAGACAAGGGCTAATCCCGATGGAAGGTGAGGAAGAGCTTAAACTCATGTCCTTCGACATC
GAGACGCTTACACGAGGGAGAAGAGTTGGAACCGGGCGATTCTGATGATAAGCTACGCCGATGAAAG
CGAGGCGCGCGTGATAACCTGGAAGAAGATCGACCTCCTTACGTTGAGGTGCTCCACCGAGAAGGAGA
TGATTAAGCGCTTCTGAGGGCGTTAAGGAGAAGGACCCGGACGTGCTGATAACATACACGGCGACAAC
TTCGACTTCGCTTACCTGAAAAGCGCTGTGAGAAGCTTGGCGTGAGCTTACCCCTGGGAGGGACGGGAG
CGAGCCGAAGATAACAGCGATGGGGACAGGTTGCGGTGAGGTGAAGGGCAGGGTACACTTCGACCTTT
ATCCAGTCATAAGGCGCACCATAACCTCCCACCTACACCCCTGAGGCTGTATACGAGGGGTTTCGGC
AAGCCAAGGAGAAGGTCTACGCCGAGGAGATAGCCACCCCTGGGAGACCGGCAGGGCTTGAGAGGGT
CGCGCGTACTCGATGGAGGACCGAGGGTACCTACGAGCTTGGCAGGGAGTTCTCCCGATGGAGGCC
AGCTTCCAGGCTATCGCCAAGGCCTCTGGACGTTCCCGCTCCAGCACCGCAACCTCGTCGAGTGG
TTCCTCTAAGGAAGGCTACGAGAGGAACGAACTCGCTCCAAACAAGCCGACGAGAGGGAGCTGGCGAG
GAGAAGGGGGCTACgcCGGTGGCTACGTCAAGGAGCCGGAGCGGGACTGTGGGACAATATCGTGTATC
TAGACTTCGTAGTCTCTACCCCTCAATCATAATCACCCACAACGCTCGCCAGATACTGCTCAACCGCGAG
GGGTGTAGGAGCTACGACGTTGCCCCGAGGTGCGTCACAAGTTCTGCAAGGACTTCCCGCTTATTCC
GAGCTGCTGAAACCTGCTGGAGGAAAGGAGAAGAGATAAAAGAGGAAGATGAAGGCAACTCTCGACCCGC
TGGAGAAGAATCTCTCGATTACAGGCAACCGCCATCAAGATTCTGCAACAGCTACTACGGCTACTAC
GGCTATGCCAGGGCAAGATGGTACTGCAGGGAGTGCAGGGAGCGTTACGGCATGGGAAGGGAGTACAT
CGAAATGGTCATCAGAGAGCTTGAGGAAAAGTCGGTTAAAGTCCTCTATGCAGACACAGACGGTCTCC
ATGCCACCATTCTGGAGCGGACGCTGAAACAGTCAAGAAAAGGCAATGGAGTTCTAAACTATCAAT
CCCAAAC TGCCGGCTTCTGAACTCGAATACGAGGGCTTCTACGTCAGGGCTTCTCGTCACGAAGAA
AAAGTACCGGGCATCGACGAGGAGGGCAAGATAACCACCGCGGGCTTGAGATAGTCAGCGCGACTGGA
GCGAGATAGCGAAGGAGACGCAAGGGTTTGAGGGCGATACTCAGGCACGGTGACGTTGAAGAGGCC
GTCAGAATTGTCAGGGAAAGTCACCGAAAAGCTGAGCAAGTACGAGGTCCGCGGAGAAGCTGGTTATCCA
CGAGCAGATAACCGCGAGCTAAGGACTACAAGGCCACCGCCCGACGTAGCCATAGCGAAgCTGGTT
CCGCCAGAGGTGTTAAATCCGGCCGGAACTGTGATAAGCTACATCGTCTGAAGGGCTCCGGAAAGGATA
GGCGACAGGGCGATTCCCTCGACGAGTTGACCGACGAAGCACAAGTACGATGCGGACTACTACATCGA
GAACCAGGTTCTGCCGGCAGTTGAGAGAATCCTCAGGGCTTCCGGTACCGCAAGGAAGACCTGCGCTACC
AGAAGACGAGGCAGGTGCGGCTTGGCGTGGCTGAAGCCGAAGGGAGAAGAAGTGA

FIG. 2.
JDF-3 DNA polymerase amino acid sequence (SEQ ID NO: 2)
Theoretical molecular weight: 90.3 kD

MILDVDYITENGKPVIRVFKKENGEFRIEYDREFEPFYALLRDSAIEEIKKITAERHGRVVVKRAEKV
KKKFLGRSVEVWVLYFTHPQDVAIRDKIRKHPAVIDIYDIPFAKRYLIDKGKIPMEGEEELKLMFDI
ETLYHEGEEFGTGPILMISYADESEARVITWKKIDLPYEVVSTEKEMIKRFLRVVKEKDPDVILITYNGDN
FDFAYLKKCEKLGVSFTLGRDGSEPKIQRMGDRFAVEVKGRVHFIDLYPVIIRTINLPTYTLEAVYEAVFG
KPKEKVYAAEIAATAWETGEGLERVARYSMEDARVTYELGREFFPMEAQLSRLIGQGLWDVSRSSTGNLVEW
FLLRKAYERNELAPNKPDERELARRGGYAGGYVKEPERGLWDNIVYLDFRSLYPSIIITHNVSPDTLNRE
GCRSYDVAPENVGHKFCKDPFGFIPSLLGNLLEERQKIKRKMKAATLDPLEKNLLDYRQRAIKILANSYYGY
GYARARWYCRECAESVTAWGREYIEMVIRELEEKFGFKVLYADTDGLHATIPGADAETVKKKAMEFLNYIN
PKLPGLLELEYEGFYVRGFFVTKKYAVIDEEGKITTRGLEIVRRDWSEIAKETQARVLEAILRHGDVEEA
VRIVREVTEKLSKYEVPPPEKLVIEHQITRELKDYKATGPHVIAKRLAARGVKIRPGTVISYIVLKGSRI
GDRAIPFDEFDPDKHYDADYYIENQVLPVERILRAFGYRKEDLRYQKTRQVGLGAWLKPKGKKK

FIG. 3.

JDF-3 DNA polymerase with intein sequence (SEQ ID NO: 3)

MILDVDYITENGKPVIRVKKENGEFRIEYDREFEPFYALLRDDSAIEE
IKKITAERHGRVVVKVRAEKVKKKFLGRSVEVWLYFTHPQDVPAIRDKI
RKHPAVIDIYEYDIPFAKRYLIDKGLIPMEGEEELKLMSFDIETLYHEGE
EFGTGPILMISYADESEARVITWKKIDLPYVEVUSTEKEMIKRFLRVVKE
KDPDVLIITYNGDNFDAYLKKRCEKLGVSFTLGRDGSEPKIQRMGDRFAV
EVKGRVHFDLYPVIRRTINLPTYTLEAVYEAVFGKPKEKVYAEIATAWE
TGEGLERVARYSMEDARVTYELGREFFPMEAQLSRLIGQGLWDVSRSSSTG
NLVEWFLLRKAYERNELAPNKPDERELARRGGYAGGYVKEPERGLWDNI
VYLDFRSLYPSIIITHNVSPDTLNREGCRSYDVAPEVGHKFCKDFPGFIP
SLLGNLLEERQKIKRKMKAITLEKNLLDYRQRAIKILAN

Extein 1

SLLPGEWVA
VIEGGKLRPVRIGELVDGLMEASGERVKRDGDTEVLEVEGLYASPSTGSP
RKPAQCR*KP**GTAMPKFTE*LSTPEGGLSVTRGHSLFAYRDASLWR*
RGRRRFKPGDLLAVPSG*PSRRGGRGSTSNCNSNCPRRKPTCHRHSKG
GRKNFFRGMLRTLWIFGEEKTGGRPGATWSTLRGLGYVKLRKIGYGVVD
REGLGKVPRFYERLVEVIRYNGNRGEFIADFNALRPVLRLMMPEKELEEW
LVGTRNGFRIRPFIEVDWKFAKLLGYYVSEGSAGKWKNRTGGWSYSVRLY
NEDGSVLDMDMERLARSSLGA*ARGELRRDFKEDGLHNLRGALRFTGREQE
GSVAYLHVP*GGPLGLP*GVLHRRRRRSPEQDGSALHQERASG*RPRPAP
ELAGRLSDKRPPRQRGLQGLRERGTALYRVPEAEERLTYSHVIPIREVLEE
TSAGPSRRT*VTGNSGSWWKAGSSTRKGPGVG*AGSSTGI*SSTGSRKSGR
KATRGTTT*ALRRRTSGGLWVPLRAQX

Intein 1

SYYGGYYGALARWYCRECAES
VTAWGREYIEMVIRELEEKFGFKVLYADTDGLHATIPGADAETVKKKAME
FLNYINPKLPGGLLELEYEGFYVRGFFVTKKYAVIDEEGKITTRGLEIVR
RDWSEIAKETQARVLEAILRHGDVEEAVRIVREVTEKLSKYEVPPPEKLVI
HEQITRELKDYKATGPHVIAKRLAARGVKIRPGTVISYIVLKGSGRIGD
RAIPFDEFDPTKHKYDADYYIENQVLPAAVERILRAFGYRKEDLRYQKTRQ
VGLGAWLKPKGKK

Extein 2

FIG. 4.

JDF-3 DNA polymerase genomic sequence (SEQ ID NO: 4)

AATTCCACTGCCGTGTTAACCTTCCACCGTTGAACCTGAGGGTGATTT
TCTGAGCCTCCTCAATCACCTTAATCGAGACCGCGGATTACCTTGAACCTGG
TACACGTTCAACGATTCGGTTCTTGTAAATGGTCGATACTGGGCCGTGCTG
GATTTCTAAACGTCTCAAGAACGGCTTCATCAACGAAACTGCCACGT 5' untranslated sequence
CTCCGCCGTGAGGGTAAACCTGAAGTTCAAGACTTGTCAACGGAAT
GGCAGAGAGAACGGCGACTACCCCCAGTGGAAAGAGCTTTGAAAGCAAAGC
CGAGCTTCAGCGAATGTGCGGTGCCCTGTTCAAGAGTTGTGAGCCCTTG
ATTGTTGTTTCTCCTCTTCTGATAACATCGATGGCGAAGTTATTAG
TTCTCAGTTGATAATCAGGCAGGTGTTGGTC

ATGATCCTTGACGTTGAT
TACATCACCGAGAAATGAAAGCCCCTCATCAGGGTCTTCAAGAAGGAGAA
CGGCGAGTTCAAGGATTGAATACGACCGCGAGTCGAGCCCTACTTCTACG
CGCTCCTCAGGGACGACTCTGCCATCGAAGAAATCAAAAGATAACCGCG
GAGAGGCACGGCAGGGTCGTTAAGGTTAACGCGCGGAGAAGGTGAAGAA
AAAGTTCTCGGCAGGTCTGTGGAGGTCTGGGTCTACTTCACGCACC
CGCAGGACGTTCCGGCAATCCCGCAGAAAATAAGGAAGCACCCCGCGGTC
ATCGACATCTACGAGTACCGACATACCCCTCGCCAAGCGCTACCTCATAGA
CAAGGGCTAATCCCAGTGGAAAGGTGAGGAAGAGCTTAAACTCATGTCCT
TCGACATCGAGACGCTTACACGAGGGAGAAGAGTTGAAACCGGGCCG
ATTCTGATGATAAGCTACCCGATGAAAGCGAGGCGCGTGTGATAACCTG
GAAGAAGATCGACCTCCTTACGTTGAGGTGTCCTCCACCGAGAAGGAGA
TGATTAAGCGCTTCTGAGGGTCGTTAAGGAGAAGGACCCGGACGTGCTG
ATAACATACAACGGCGACAACCTCGACTTCGCTTACCTGAAAAAGCGCTG
TGAGAAAGCTTGGCGTGANAGCTTACCTCGGGAGGGACGGGAGCGAGCCGA Extein 1
AGATACAGCGCATGGGGACAGGTTGCGGTGAGGTGAAGGGCAGGGTA
CACTTCGACCTTATCCAGTCATAAGGCGCACCATAAACCTCCGACCTA
CACCTTGAGGTGTATACGAGGCGTTTCCGCAAGCCCAAGGAGAAGG
TCTACGCCGAGGAGATAGCCACCGCTGGAGACCGCGAGGGGCTTGAG
AGGGTCGCGCCTACTCGATGGAGGACGCGAGGGTACCTACGAGCTGG
CAGGGAGTTCTTCCGATGGAGGCCAGCTTCCAGGCTCATCGGCCAAG
GCCTCTGGACGTTCCCGCTCCAGCACCGCAACCTCGTGTGAGTGGTTC
CTCCTAAGGAAGGCCTACCGAGAGGAACGAACTCGCTCCAAACAAGCCGA
CGAGAGGGAGCTGGCGAGGAGAAGGGGGCTACGCCGGTGGCTACGTCA
AGGAGCCGGAGCGGGGACTGTGGGACAATATCGTGTATCTAGACTTCGT
AGTCTCTACCCCTCAATCATAACTACCCACAAACGTCTCGCCAGATACGCT
CAACCGCGAGGGGTGTAGGAGCTACGACGTTGCCCGAGGTGGTCA
AGTTCTGCAAGGACTTCCCGCTTCATTCCGAGCCTGCTCGAAACCTG
CTGGAGGAAAGCAGAAGATAAAGAGGAAGATGAAGGCAACTCTCGACCC
GCTGGAGAAGAATCTCCTCGATTACAGGCAACCGGCCATCAAGATTCTCG
CCAAC

AGCCTTCTCCGGGAGTGGTTGCGGTATTGAAGGGGGAAA
CTCAGGCCGTCGCATCGCGAGCTGGTTGATGGACTGATGGAAGCCAG
CGGGGAGAGGGTGAAGAGACGGCGACACCGAGGTCTTGAAGTCGAGG
GGCTTACGCCCTCCTCGACAGGGAGTCCAAGAAAGCCGCACAAATGC
CGGTGAAAGCCGTGATAAGGCACCGCTATGCCGGGAAGTTACAGAATA
GCTCTCAACTCCGGAAAGGAGGATTAAGCGTGACCGCGGCCACAGCCTCT
TCGCGTACCGGGACCGCGAGCTTGTGGAGGTGACGGGGAGGAGGAGGTTCA
AAGCCCGCGACCTCCTGGCGGTGCCAAGCGGATAACCCCTCCGGAGGAGG Intein 1

AGGGAGAGGCTAACATCGTTGAAC TGCTCCTCGAACTGCCCGAGGAGGA
AACGGCCGACATGTCA TCGACATTCCGGCAAGGGTAGAAAGAACTTCTTC
AGGGGAATGCTCAGAACCCCTCCGCTGGATTTCGGGGAGGAGAAGACCGG Intein 1
AGGGCGGCCAGGCCTACCTGGAGCACCTTGCCTGGCTCGGCTACGTGA
AGCTGAGGAAAATCGGCTACGGGTGGTTGATAGGGAGGGACTGGGAAAG
GTACCGCGCTCTACGAGAGGCTCGTGGAGGTAATCCGCTACAACGGCAA
CAGGGGGAGTTCATGCCGATTTCAACCGCCTCCGCCCGCTCCGCC
TGATGATGCCGAGAAGGAGCTTGAAAGAGTGGCTCGTTGGGACGAGGAAC
GGGTTCAAGATAAGGCCGTTCATAGAGGTTGATTGGAAGTTCGCAAAGCT
CCTCGGCTACTACGTGAGCGAGGGAGCGCCGGAAAGTGGAAAAACCGGA
CCGGGGGCTGGAGCTACTCGGTGAGGCTTACAACGAGGACGGGAGCGTT
CTCGACGACATGGAGAGACTCGCGAGGAGTTCTTGGGGCGTGAGCGC
GGGGGAACTACGTGAGATTCAAAGAAGATGGCTACATAATCTCGAG
GGGCTCTGCCTTCACCGGCCGAGAACAGAGGGTTCCGTGGCTTATCTT
CACGTCCTCTGAGGAGGTCCGCTGGCCTTCCTGAGGGTACTTCATCG
GCGACGGCGACGTTCACCGAGCAAGATGGTTCGGCTCTCCACCAAGAGC
GAGCTCTGGCTAACGGCTCGTCCCTGCTCTGAACTCGCTGGCGTCTC
AGCGATAAACGTCCGCCACGACAGCGGGTTACAGGGTCTACGTGAACG
AGGAACACTGCCCTTACAGAGTACCGGAAGCGGAAGAACGCTCACTTACT
CCCACGTACACCGAGGGAAAGTGTGGAGGAGACTTCGGCCGGCTTCC
AGAAGAACATGAGTCACGGAAATTCAAGGGAGCTGGTGGAAAGCGGGGAG
CTCGACGCGAAAGGGCGGTAGGATAGGCTGGCTCTCGACGGGATAT
AGTCCTCGACAGGGTCTCGGAAGTCAGGAAGGAAGCTACGAGGGTACG
TCTACGACCTGAGCGTTGAGGAGGACGAGAACCTCTGGCGGGCTTGGGT
TCCTCTACGCGCACACNN

AGCTACTACGGCTACTACGGCTATGCCAGGG
CAAGATGGTACTGCAGGGAGTGCAGGCCAGAGCGTTACGGCATGGGAAGG
GAGTACATCGAAATGGTCA TCGAGAGCTTGAGGAAAAGTTGGTTAA
AGTCCTCTATGCAGACACAGACGGCTCCATGCCACCATTCTGGAGCG
ACGCTGAAACAGTCAGGAAAAGGCAATGGAGTTCTAAACTATATCAAT
CCCAAAC TGCCGCCCTCTCGA ACTCGAATACGAGGGCTCTACGTCA
GGGCTCTCGTACGAAGAAAAGTACGCGGTATCGACGAGGAGGGCA
AGATAACCACGCGCGGGCTTGAGATAGTCAGGCGCAGTGGAGCGAGATA
GCGAAGGAGACGCAGGCAGGGTTTGGAGGCAGACTCAGGCACGGTGA Extein 2
CGTTGAAGAGGCCGTCAGAATTGTCAAGGAAGTCACCGAAAAGCTGAGCA
AGTACGAGGTTCCGCCAGAGCTGGTTATCCACGAGCAGATAACGCGC
GAGCTCAAGGACTACAAGGCCACCGGCCGACGTAGCCATAGCGAAGCG
TTTGGCCGCCAGAGGTGTTAAATCCGGCCCGGAAGTGTGATAAGCTACA
TCGTTCTGAAGGGCTCCGGAGGATAGGCAGACAGGGGATTCCTTCGAC
GAGTCGACCCGACGAAGACAAGTACGATGCCGACTACTACATCGAGAA
CCAGGTTCTGCCGGCAGTTGAGAGAACCTCAGGGCTTCGGCTACCGCA
AGGAAGACCTCGCTACCAAGAACGAGGAGCAGTCGGGCTTGGCGCGTGG
CTGAAGCCGAAGGGGAAGAAGAAGTGA

GGAATTATCTGGTTCTTTCCC
AGCATTAAATGCTCCGACATTGCCCTATTTATGAAACTCCTGTTGTGCC
TGAGTTTGTGCCAGAAAACAGCCTGTTGACGGCGTTTCTGCCAG
GTCTCTGAGTTGCAAGGGCTTCTCGACCGAGCTCAATGGTCTTGTG
TCATTGTTNNNNNNNNNNNNNNNNNNNNNNCCGGGGACTTCATACTGGC
GGTAATAGACAGGGATTCTCCTCAAGGACTCCGGAGGCATTGGAG
TTTTTGGTGGGCTTCACAGGATTGCTCATCTGTGGATTCTCGTT
CGATTGAATCTGTCCACTTGAGGGTAGGTCAGACGGTGGAGCGCGTA

TTCCGGGAGCGGGCTTGAGGCTCATTTCAGTCCTCCTCCGGCGAAG 3' Untranslated sequence
AAGTGGAACTCAAGCCGGGTAGCTTATGTTATGTCCTCAACTCCTCC
AGCACCTCCAGGATCCCTCAATCCCGGAACCTCGAAGCCCCCTCTCGTGG
ATCTTCTAACTCCTCTGCCTCCGGGTTTATCCAGACGCCACATGCC
GGCTCTCAGCGCACCCCTCGAAATCCCTCCCGTAGGTGTCGCCGATGTGGA
TTGCCTCGTCCGGCTCGACCCCGAACGATCGAGCGGTTTCTGAACATCT
CGGGCATCGGCTTATACGCCAGAACCTCGTCGGCGAAGAAGGTTCCCTCA
ATGTAGTCCATCAGGCCAACCTCTCGAGGGGGGCCCGGTACCCAATTC
GCCCTATAGTGAAGTCGATTACAATTCACTGGCCGTCGTTTACAACGTCG
TGACTGGAAAACCTGGCGTTACCCAACCTTAAGTCGTTGCAGCACAT
CCCCC

Preliminary Qualification of Mutants

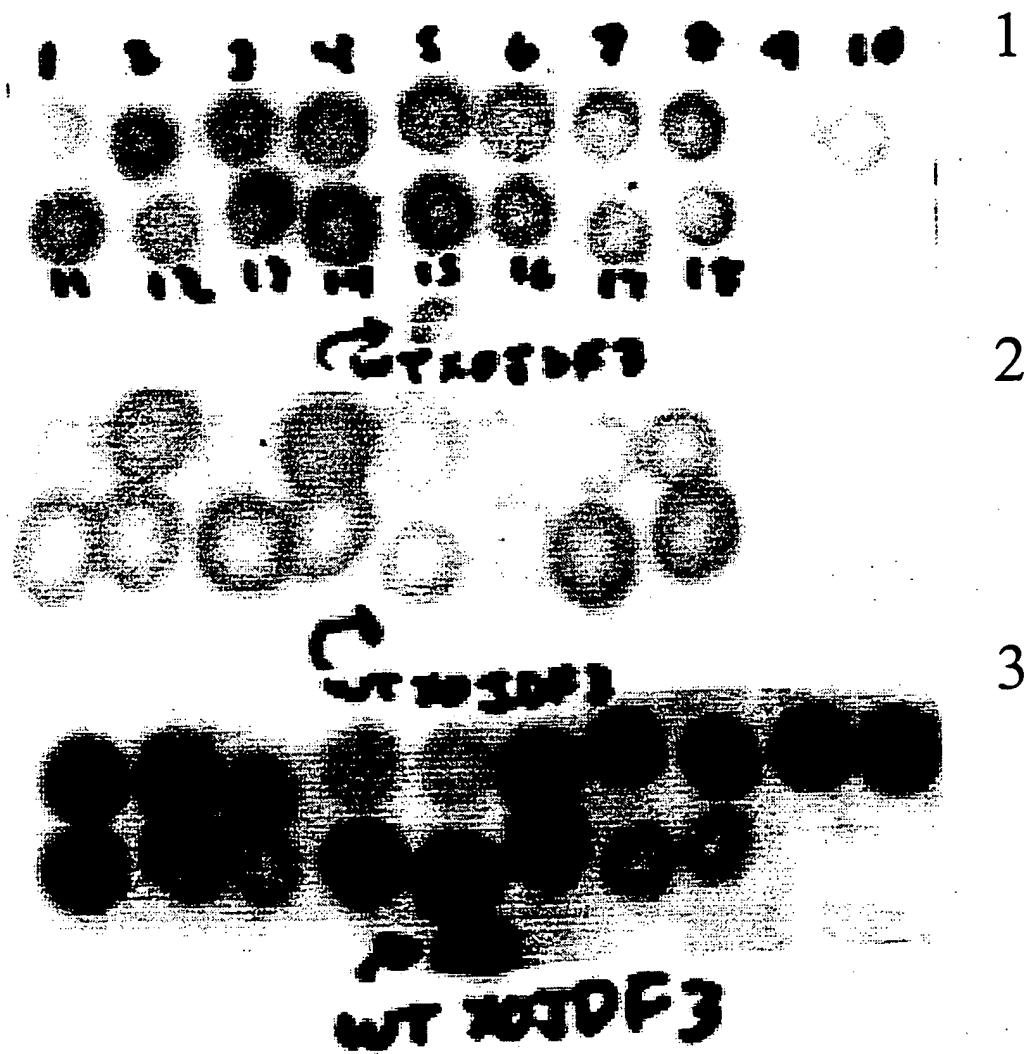
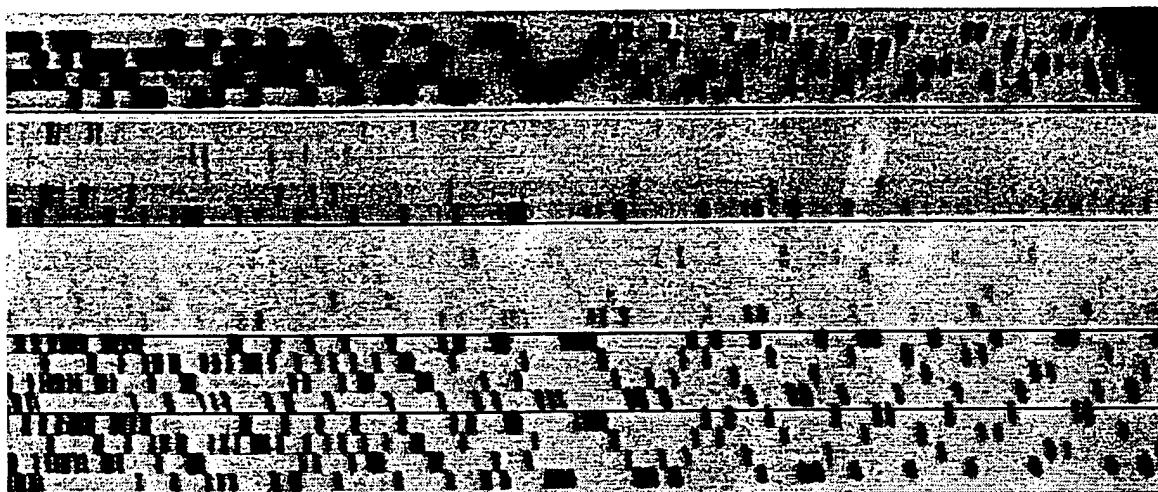


Figure 5

Sequencing with Purified Mutants



A
B
C
D
E

Figure 6

Sequencing with Dye-labeled Dideoxynucleotides

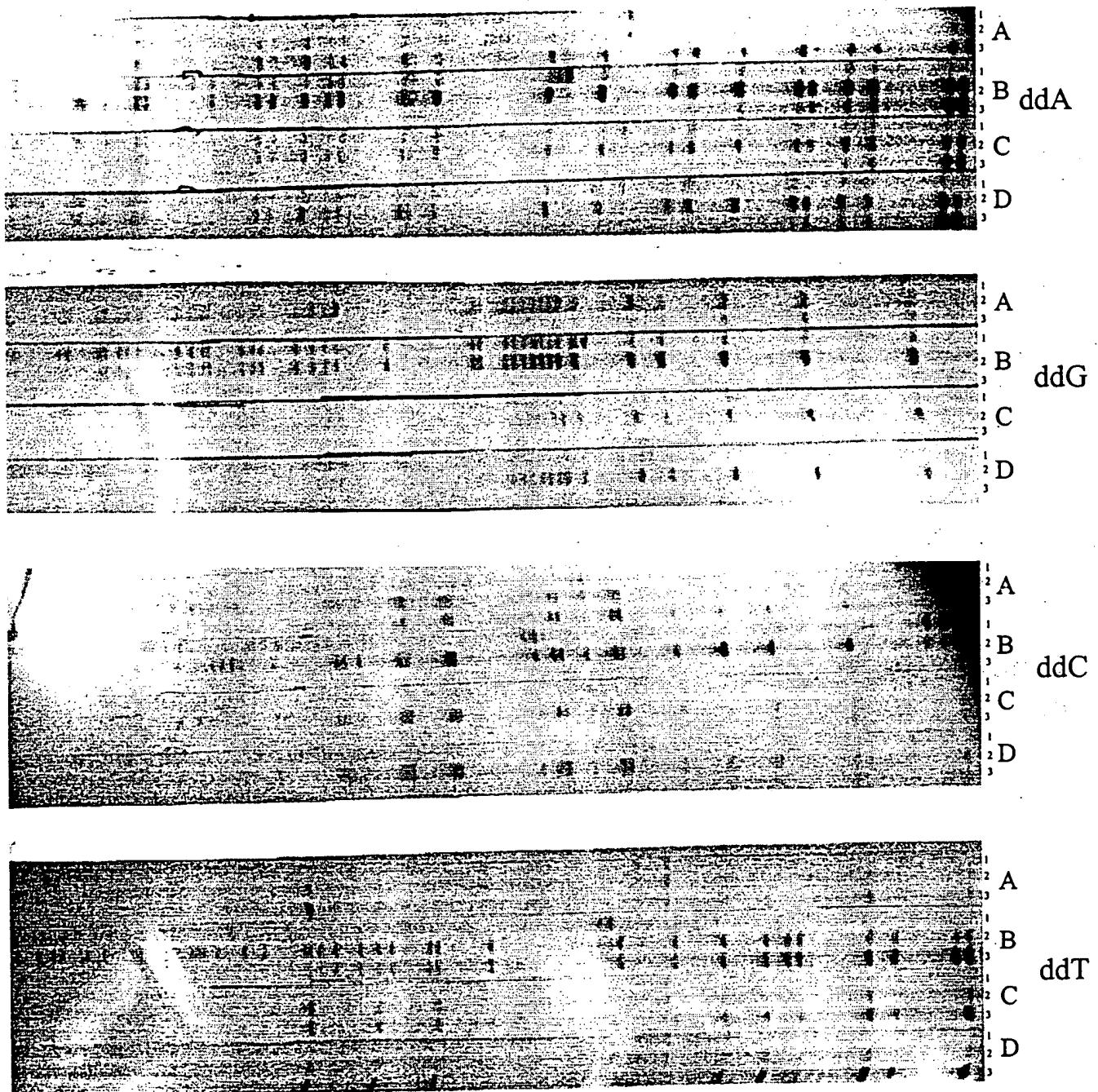


Figure 7

Sequencing with the P410L, A485T Double Mutant and α -³³P Dideoxynucleotides

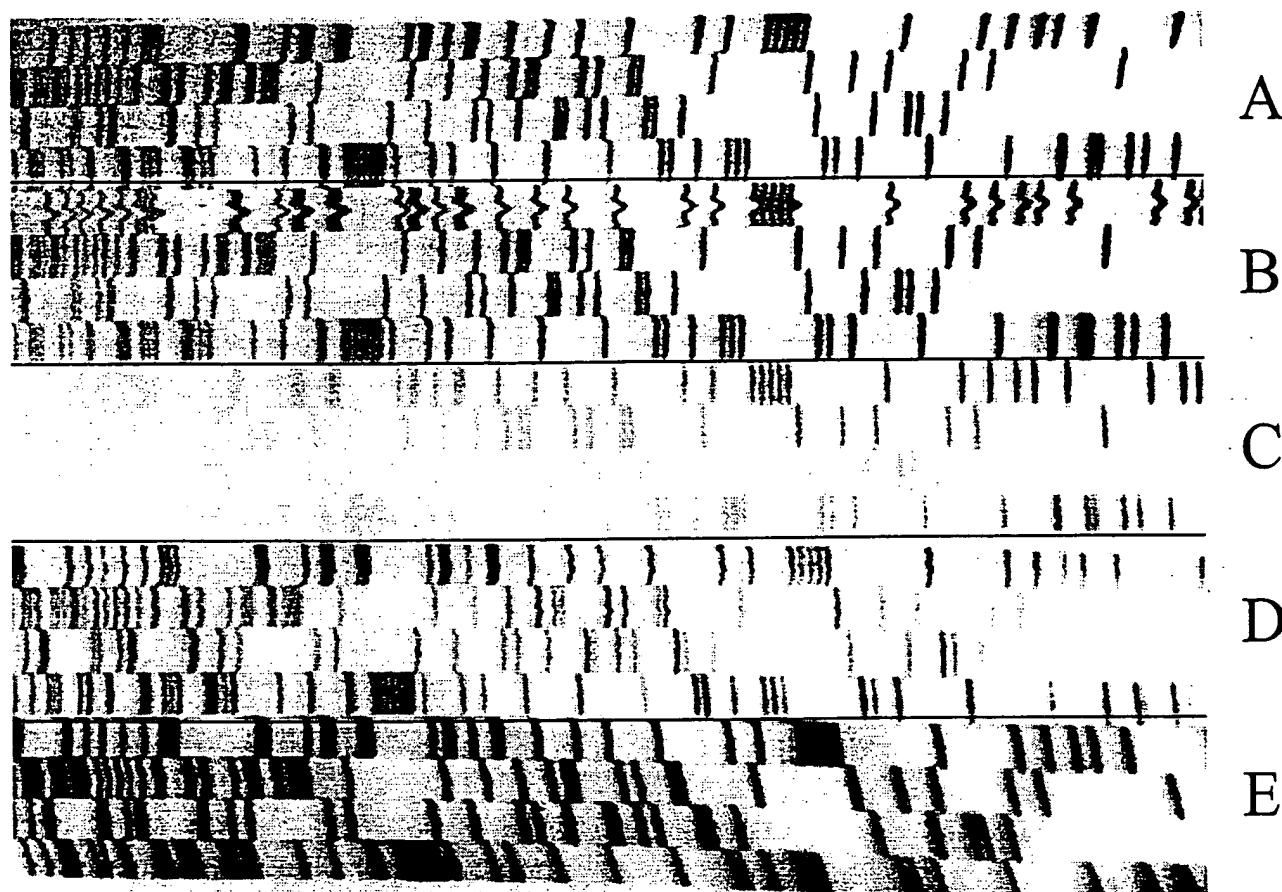
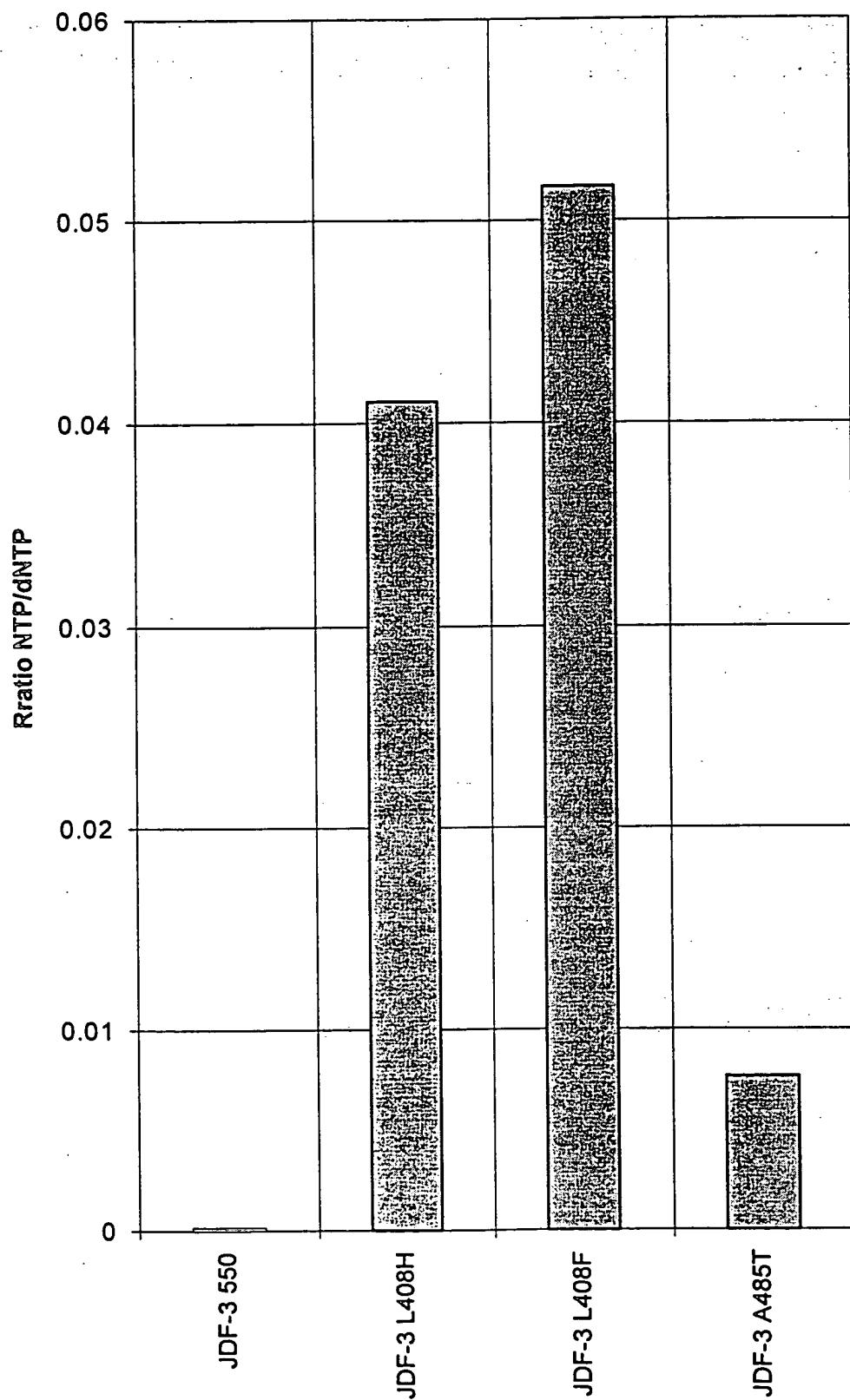


Figure 8

Figure 9



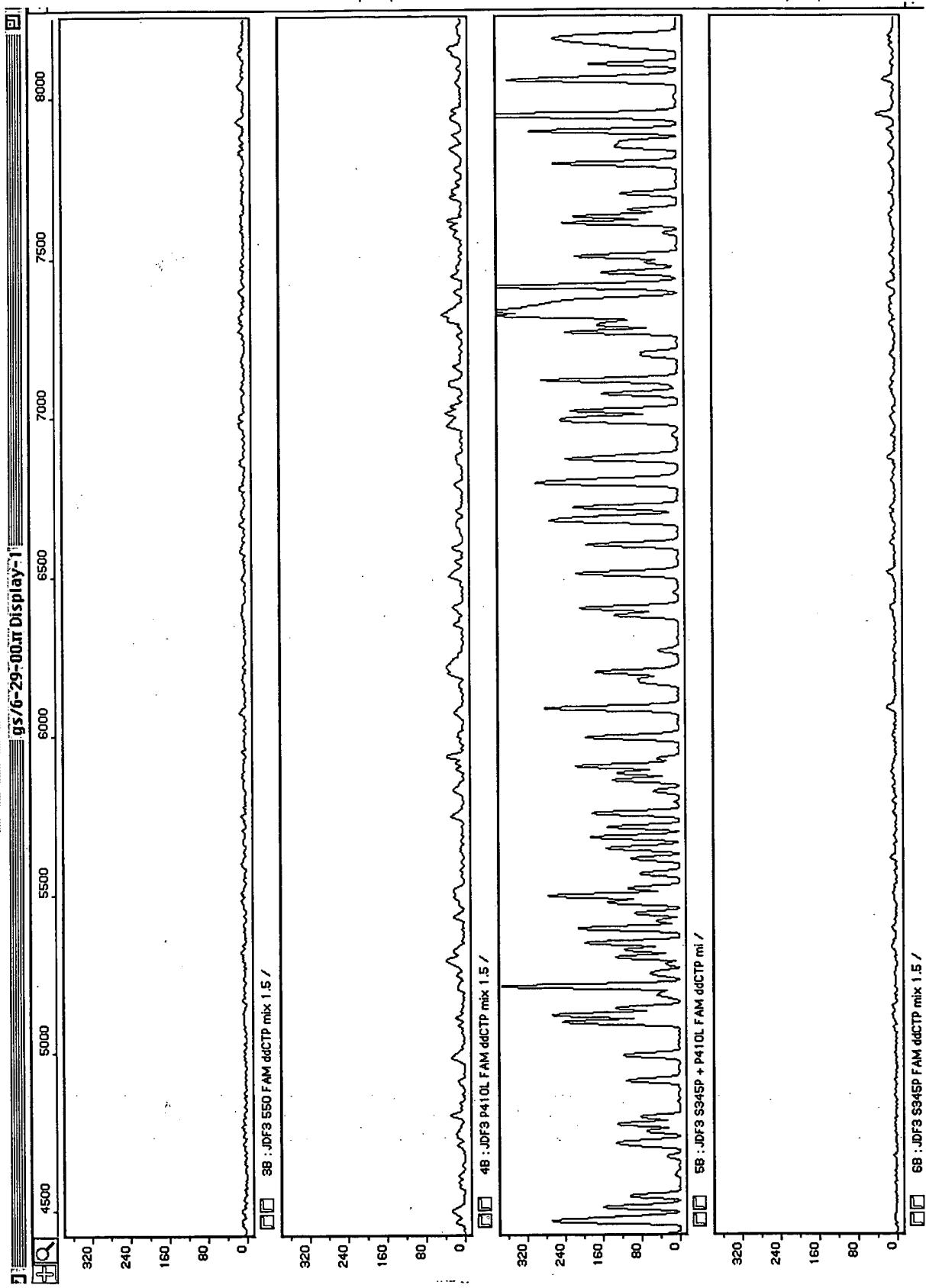


Figure 10

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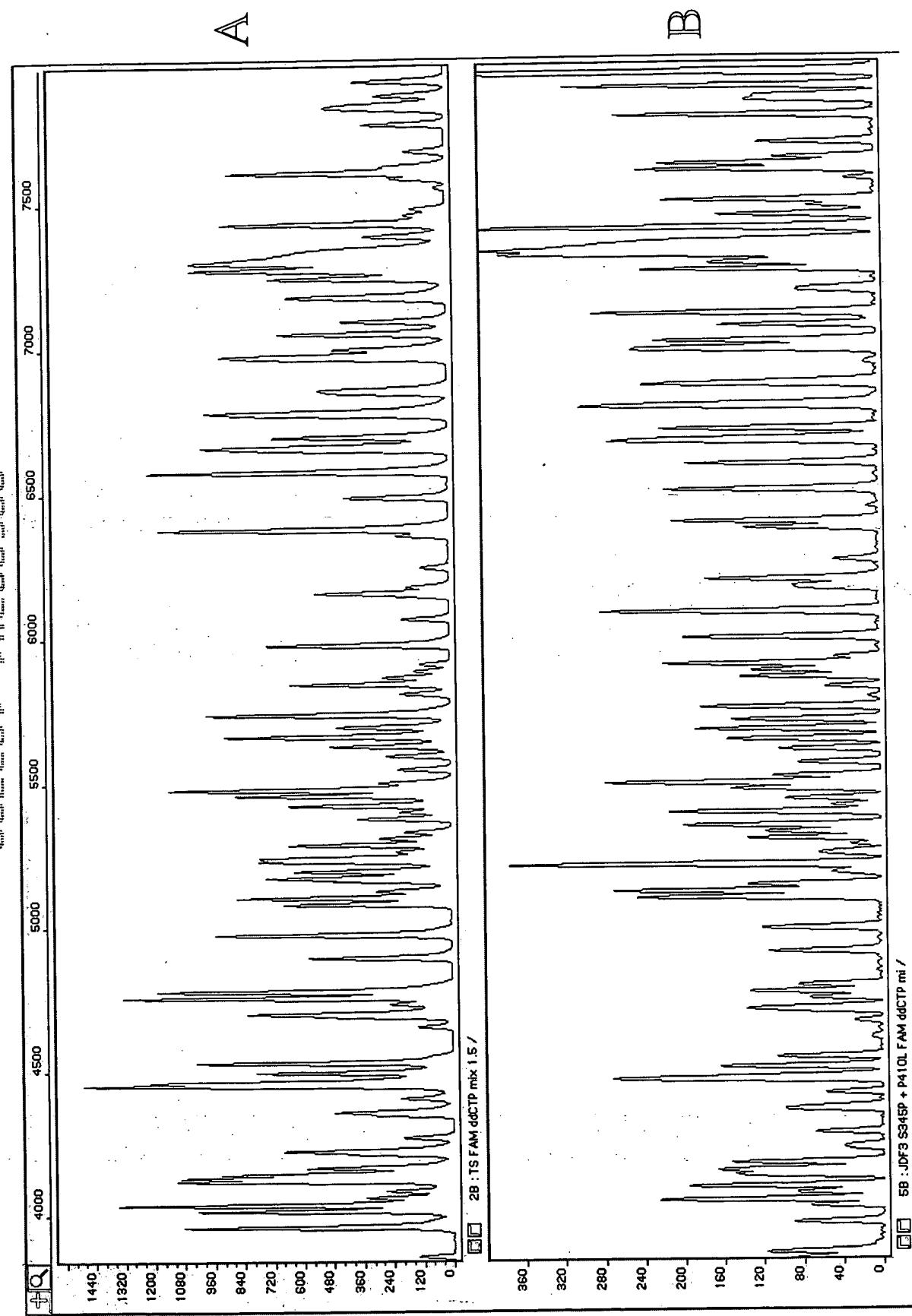


Figure 11

^{33}P - TAACGTTGGGGGGGGCA →
TGCAACCCCCCGTAT

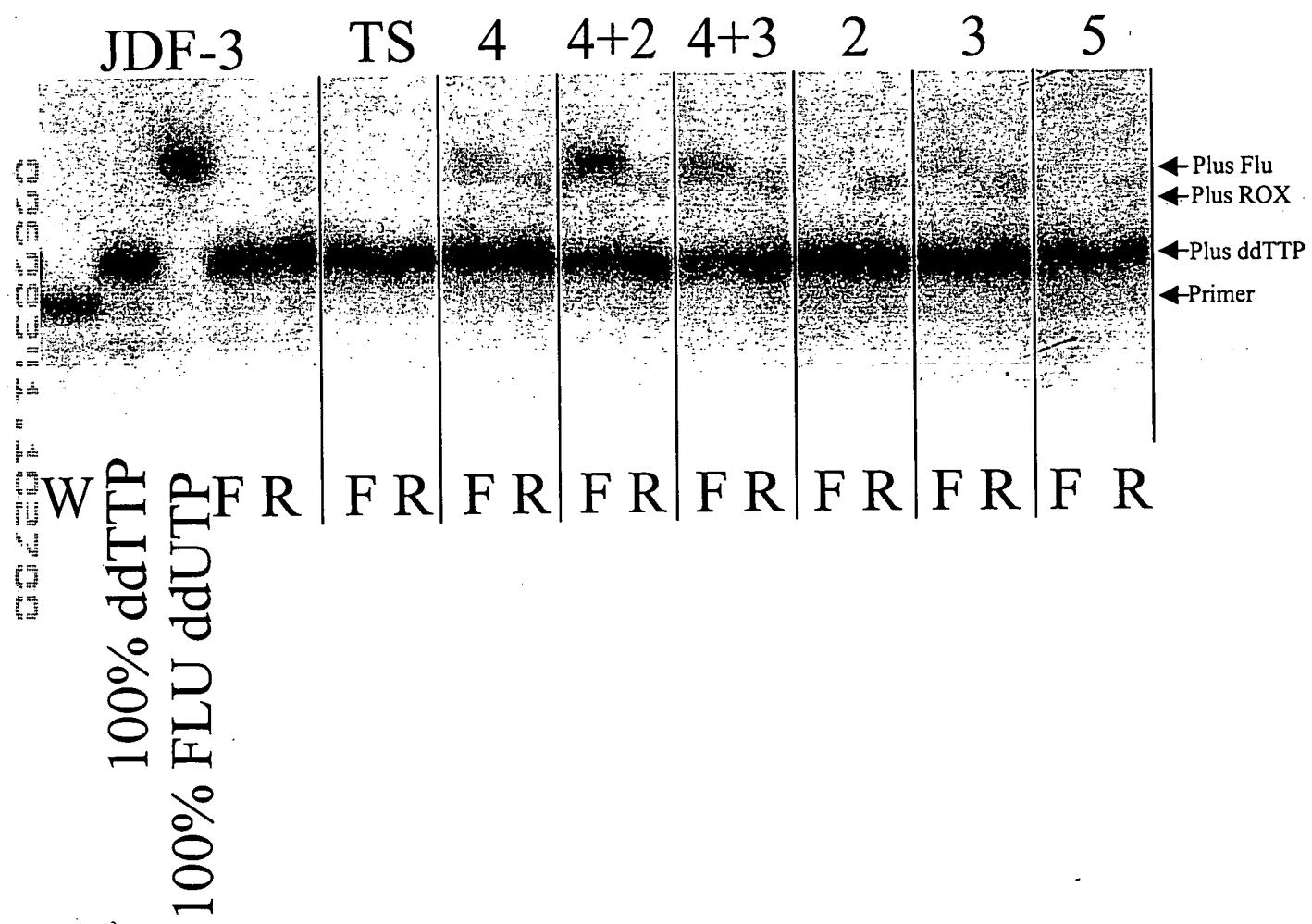


Figure 12

Flu ddUTP signal/ddTTP signal

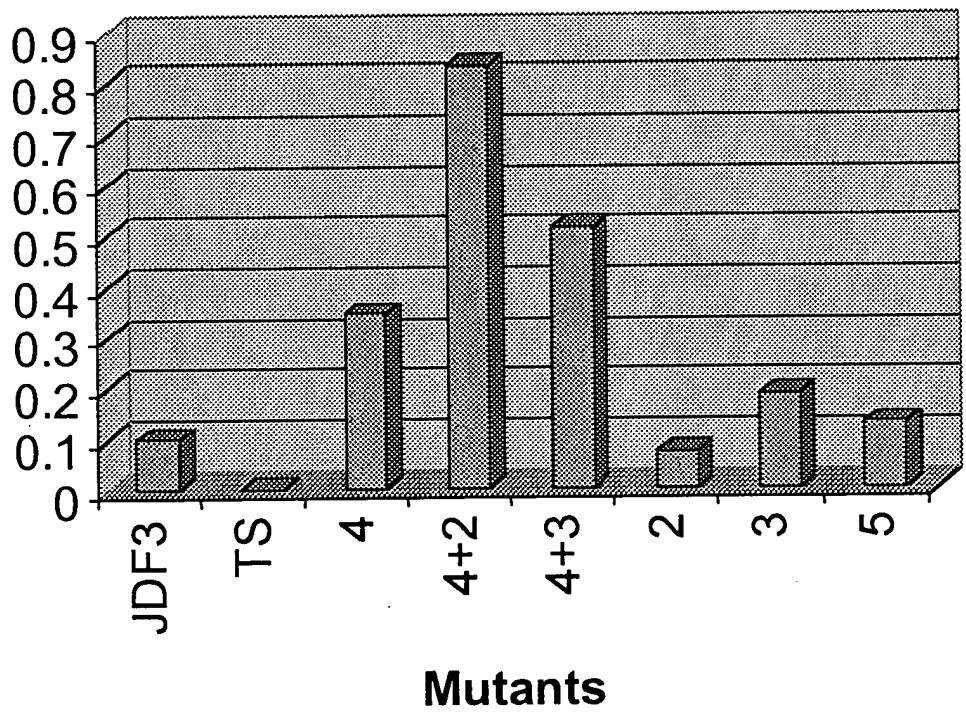


Figure 13

4 1 ----- LVXNAXSTGNLVEWFLLRK
 10 1 ----- VWDVSRSSSTGNLVERFLLRK
 13 1 ----- VWDVSRSSSTGNLVEWFLLRK
 16 1 ----- VWDVSRSSSTGNLVEWFLLRK
 18 1 ----- VWDVSRSSSTGNLVEWFLLRK
 19 1 ----- VWDVSRSSSTGNLVEWFLLRK
 28 1 ----- VWDVSRSSSTGNLVEWFLLRK
 34 1 ----- VWDVSRSSSTGNLVEWFLLRK
 41 1 ----- VWDVSRSSSTGNLVEWFLLRK
 33 1 ----- VWDVSRSSSTGNLVEWFLLRK
 48 1 ----- YWSXPXLRTGNLVEWFLLRK
 55 1 ----- VIGTXPRSSSTGNLVEWFLLRK
 64 1 ----- XXXFWDVSRSSTGNLVEWFLLRK
 Jdf3 301 TGEGLERVARYSMEDARVTVYELGREFFPMEAQLSRLIGQGFWDVSRSSTGNLVEWFLLRK

4 20 AYERNELAPNKPDERELARRGGYAGGYVKEPERGLWDNIVYLDFRSLYPSIIITHNVSP
 10 21 AYERNELAPNKPDERELARRGGYAGGYVKEPERGLWDNIVYLDFRSLYPSIIITHSVSP
 13 21 AYERNELAPNKPDERELARRGGYAGGYVKEPERGLWDNIVYLDFRSLYPSIIITHNVSP
 16 21 AYERNELAPNKPDERELARRGGYAGGYVKEPERGLWDNIVYLDFRSLYPSIIITHNVSP
 18 21 AYERNELAPNKPDERELARRGGYAGGYVKEPERGLWDNIVYLDFRSLYPSIIITHNVSP
 19 21 AYERNELAPNKPDERELARRGGYAGGYVKEPERGOWDNIAYLDFRSLYPSIIITHNVSP
 28 21 AYERNELAPNKPDERELARRGGYAGGYVKEPERGLWDNIVYLDFRSLYPSIIITHNVSP
 34 21 AYERNELAPNKPDERELARRGGYAGGYVKEPERGLWDNIVYLDFRSLYPSIIITHNVSP
 41 21 AYERNELAPNKPDERELARRGGYAGGYVKEPERGFWDNIVYLDFRSLYPSIIITHNVSP
 33 21 AYERNKAPNKPDERELARRGGYAGGYVKEPERGLWDNIVYLDFRSLYPSIIITHNVSP
 48 21 AYERNELAPNKPDERELARRGGYAGGYVKEPERGLWDNIVYLDFRSLYPSIIITHNVSP
 55 22 AYERNELAPNKPDERELARRGGYAGGYVKEPERGLWDNIVYLDFRSHYPSIIITHNVSP
 64 24 AYERNELAPNKPDERELARRGGYAGGYVKEPERGLWDNIVYLDFRSLYPSIIITHNVSP
 Jdf3 361 AYERNELAPNKPDERELARRGGYAGGYVKEPERGLWDNIVYLDFRSLYPSIIITHNVSP

4 80 DTLNREGCRSYDVAPEVGHKFKDPFGFIPSLGNLLEERQKIKRKMKTLDPLEKNLLD
 10 81 DTLREGCRSYDVAPEVGHKFKDPFGFIPSLGNLLEERQKIKRKMKTLDPLEKNLLD
 13 81 DTLNREGCRSYDVAPEVGHKFKDPFGFIPSLGNLLEERQKIKRKMKTLDPLEKNLLD
 16 81 DTLNREGCRSYDVAPEVGHKFKDPFGFIPSLGNLLEERQKIKRKMKTLDPLEKNLLD
 18 81 DTLNREGCRSYDVAPEVGHKFKDPFGFIPSLGNLLEERQKIKRKMKTLDPLEKNLLD
 19 81 DTLKREGCRSYDVAPEVGHKFKDPFGFIPSLGNLLEERQKIKRKMKTLDPLEKNLLD
 28 81 DTLNREGCRSYDVAPEVGHKFKDPFGFIPSLGNLLEERQKIKRKMKTLDPLEKNLLD
 34 81 DTLNREGCRSYVAPEVGHKFKDPFGFIPSLGNLLEERQKIKRKMKTLDPLEKNLLD
 41 81 DTLNREGCRSYVAPEVGHKFKDPFGFIPSLGNLLEVRQKIKRKMKTLDPLEKNLLD
 33 81 DTLNREGCRSYDVAPEVGHKFKDPFGFIPSLGNLLEERQKIKRKMKTLDPLEKNLLD
 48 81 DTLNREGCRSYDVAPEVGHKFKDPFGFIPSLGNPLEERQKIKRKMKTLDPLEKNLLD
 55 82 DTLNREGCRSYDVAPEVGHKFKDPFGFIPSLGNLLEERQKIKRKMKTLDPLEKNLLD
 64 84 DTLNREGCRSYDVAPEVGHKFKDPFGFIPSLGNLLEERQKIKRKMKTLDPLEKNLLD
 Jdf3 421 DTLNREGCRSYDVAPEVGHKFKDPFGFIPSLGNLLEERQKIKRKMKTLDPLEKNLLD

Figure 14

4 140 YRQRAIKILANSYYGYGYARARWYCRECAESVTAWGREYIEMVIRELEEKFGFKVLYAD
 10 141 YRQRAIKILANSYYGYGYARARWYCRECAESVTAWGREYIEMVIRELEEKFGFKVLYAD
 13 141 YRQRAIKILANSYYGYGYARARWYCRECAESVTAWGREYIEMVIRELEEKFGFKVLYAD
 16 141 YRQRAIKILANSYYGYGYARARWYCRECAESVTAWGREYIEMVIRELEEKFGFKVLYAD
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 28 141 YRQRAIKILANSYYGYGYARARWYCRECAESVTAWGREYIEMVIRELEEKFGFKVLYAD
 34 141 YRQRAIKILANSYYGYGYARARWYCRECAESVTAWGREYIEMVIRELEEKFGFKVLYAD
 41 141 YRQRAIKILANSYYGYGYARARWYCRECAESVTAWGREYIEMVIRELEEKFGFKVLYAD
 33 141 YRQRAIKILANSYYGYGYARARWYCRECAESVTAWGREYIEMVIRELEEKFGFKVLYAD
 48 141 YRQRAIKILANSYYGYGYARARWYCRECAESVTAWGREYIEMVIRELEEKFGFKVLYAD
 55 142 YRQRAIKILANSYYGYGYARARWYCRECAESVTAWGREYIEMVIRELEEKFGFKVLYAD
 64 144 YRQRAIKILANSYYGYGYARARWYCRECAESVTAWGREYIEMVIRELEEKFGFKVLYAD
 Jdf3 481 YRQRAIKILANSYYGYGYARARWYCRECAESVTAWGREYIEMVIRELEEKFGFKVLYAD

4 200 TDGLHATIPGADAETVKKKAMEFLNYINPKLPGGLELEYEGFYVRGFFVTKKKYAVIDEE
 10 201 TDGLHATIPGADAETVKKKAMEFLNYINPKLPGGLELEYEGFYVRGFFVTKKKYAVIDEE
 13 201 TDGLHATIPGADAETVKKKAMEFLNYINPKLPGGLELEYEGFYVRGFFVTKKKYAVIDEE
 16 201 TDGLHATIPGADAETVKKKAMEFLNYINPKLPGGLELEYEGFYVRGFFVTKKKYAVIDEE
 18 201 TDGLHATIPGADAETVKKKAMEFLNYINPKLPGGLELEYEGFYVRGFFVTKKKYAVIDEE
 19 201 TDGLHATIPGADAETVKKKAMEFLNYINPKLPGGLELEYEGFYVRGFFVTKKKYAVIDEE
 28 201 TDGLHATIPGADAETVKKKAMEFLNYINPKLPGGLELEYEGFYVRGFFVTKKKYAVIDEE
 34 201 TDGLHATIPGADAETVKKKAMEFLNYINPKLPGGLELEYEGFYVRGFFVTKKKYAVIDEE
 41 201 TDGLHATIPGADAETVKKKAMEFLNYINPKLPGGLELEYEGFYVRGFFVTKKKYAVIDEE
 33 201 TDGLHATIPGADAETVKKKAMEFLNYINPKLPGGLELEYEGFYVRGFFVTKKKYAVIDEE
 48 201 TDGLHATIPGADAETVKKKAMEFLNYINPKLPGGLELEYEGFYVRGFFVTKKKYAVIDEE
 55 202 TDGLHATIPGADAETVKKKAMEFLNYINPKLPGGLELEYEGFYVRGFFVTKKKYAVIDEE
 64 204 TDGLHATIPGADAETVKKKAMEFLNYINPKLPGGLELEYEGFYVRGFFVTKKKYAVIDEE
 Jdf3 541 TDGLHATIPGADAETVKKKAMEFLNYINPKLPGGLELEYEGFYVRGFFVTKKKYAVIDEE

4 260 GKITTRGLEIVRRDWSEIAKETQARVLEAVLRHGDVEEAVRIVREVTEKLSKYEVPPPEKL
 10 261 GKITTRGLEIVRRDWSEIAKETQARVLEAILRHGDVEEAVRIVREVTEKLSKYEVPPPEEL
 13 261 GKITTRGLEIVRRDWSEIAKETQARVLEAILRHGDVEEAVRIVREVTEKLSKYEVPPPEKL
 16 261 GKITTRGLEIVRRDWSEIAKETQARVLEAILRHGDVEEAVRIVREVTEKLSKYEVPPPEKL
 18 261 GKITTRGLEIVRRDWSEIAKETQARVLEAILRHGDVEEAVRIVREVTEKLSKYEVPPPEKL
 19 261 GKITTRGLEIVRRDWSEIAKETQARVLEAILRHGDVEEAVRIVREVTEKLSKYEVPPPEKL
 28 261 GKITTRGLEIVRRDWSEIAKETQARVLEAILRHGDVEEAVRIVREVTEKLSKYEVPPPEKL
 34 261 GKITTRGLEIVRRDWSEIAKETQARVLEAILRHGDVEEAVRIVREVTEKLSKYEVPPPEKL
 41 261 GKITTRGLEIVRRDWSEIAKETQARVLEAILRHGDVEEAVRIVREVTEKLSKYEVPPPEKL
 33 261 GKITTRGLEIVRRDWSEIAKETQARVLEAILRHGDVEEAVRIVREVTEKLSKYEVPPPEKL
 48 261 GKITTRGLEIVRRDWSEIAKETQARVLEAILRHGDVEEAVRIVREVTEKLSKYEVPPPEKL
 55 262 GKITTRGLEIVRRDWSEIAKETQARVLEAILRHGDVEEAVRIVREVTEKLSKYEVPPPEA
 64 264 GKITTRGLEIVRRDWSEIAKETQARVLEAILRHGDVEEAVRIVREVTEKLSKYEVPPPEKL
 Jdf3 601 GKITTRGLEIVRRDWSEIAKETQARVLEAILRHGDVEEAVRIVREVTEKLSKYEVPPPEKL

Figure 15